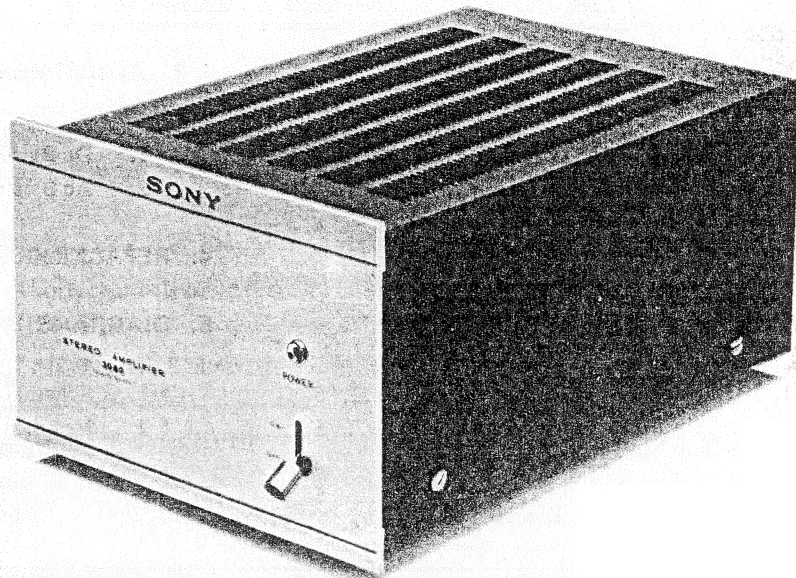




Set using ISO screws

TA-3060



SONY®
SERVICE MANUAL

TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Page</u>	<u>Section</u>	<u>Title</u>	<u>Page</u>
1. TECHNICAL DESCRIPTION			3. ADJUSTMENTS		
1-1.	Technical Specifications	1	3-1.	Dc Bias Adjustment	9
1-2.	Detailed Circuit Analysis	1~3	3-2.	Ac Balance Adjustment	10
1-3.	Block Diagram	4	4. REPACKING		11
2. DISASSEMBLY AND REPLACEMENT PROCEDURES			5. DIAGRAMS		
2-1.	Tools Required	5	5-1.	Schematic Diagram	12
2-2.	Hardware Identification Guide	5	5-2.	Mounting Diagram Protection Circuit Board	13
2-3.	Top Cover and Front Panel Removal	5	5-3.	Mounting Diagram Power Amplifier Board	14~15
2-4.	Power Switch Replacement	5~6	6. EXPLODED VIEW		16
2-5.	Pilot Lamp Replacement	6	7. ELECTRICAL PARTS LIST		17~18
2-6.	Power Transistor Replacement ..	6~7			
2-7.	Replacement of Components Secured to the Rear Panel by Rivets	7			
2-8.	Chassis Layout	8			

SECTION 1 TECHNICAL DESCRIPTION

1-1. TECHNICAL SPECIFICATIONS

Technical specifications for the TA-3060 are given in Table 1.

TABLE 1. SPECIFICATIONS

Power Amplifier Section

Dynamic power output	: 70 watts both channels operating, 8 ohms (IHF)
Rated output	: 30 watts per channel, 8 ohms, both channels operating
Power bandwidth	: 6 Hz to 35 kHz, 8 ohms (IHF)
Harmonic distortion	: Less than 0.1% at 1 kHz at rated output Less than 0.05% at 1 watt output (1 kHz)
IM distortion (60 Hz: 7 kHz=4:1)	: Less than 0.2% at rated output Less than 0.03% at 1 watt output
Frequency response	: 5 Hz to 300 kHz +0 dB -2 dB at 1 watt output
Input sensitivity and impedance	: 0.9 V 100 k ohms
Residual noise	: Less than 0.03 μ W, 8 ohms
Signal to noise ratio	: Greater than 110 dB (closed circuit)

General

Power requirement	: 100, 117, 220, 240 V ac 50/60 Hz
Power consumption	: USA, CANADA 130 W General Export Model 175 W (IEC)
AC outlet	: Unswitched, 300 watts maximum
Dimensions	: 7 ⁷ / ₈ " (W) \times 5 ⁷ / ₈ " (H) \times 12 ⁷ / ₁₆ " (D) 200 (W) \times 149 (H) \times 316 (D) mm
Weight	: 5.8 kg (12 lb 13 oz)
Shipping weight	: 7.3 kg (16 lb.)

1-2. DETAILED CIRCUIT ANALYSIS

The following describes the functions of all stages and controls. The text sequence follows signal paths. Stages are listed by transistor reference designation at the left margin; major components are also listed in a similar manner. Refer to the block diagram on page 4 and schematic diagram on page 12.

<u>Stage/Control</u>	<u>Function</u>
LEVEL CONTROL (Variable attenuator) R101	Controls the input signal amplitude to obtain a desired output power.
Preamplifier Q101	Amplifies the input signal to the level required for the following driver stage. The ac output appears across load resistor R107 (2.2 k) in the collector circuit. Emitter decoupling capacitor is C102. C102 and resistor R104 in the emitter circuit form a frequency-selective ac bypass circuit to reduce the amplifier's gain at very low frequencies.
Thermal compensation D303, D101	As all the stages are directly coupled, dc stability is required. The negative temperature coefficient of D303 provides thermal compensation for this stage, and D101 compensates the following driver stage's operation. To obtain sufficient stability, dc negative feedback via R120, R105 and R106 and ac negative feedback via R120, R104, C107 and C102 are provided.
Ac balance adj.	Q101's emitter is connected to the negative power supply through R105 and R106 (ac balance adj.) To obtain the minimum harmonic distortion, R106 is adjusted to set the speaker terminal at zero volt dc.

Stage/Control

Function

Predriver Q102

Though this stage is a conventional flat amplifier, it determines the output voltage swings because the following stages are basically in the emitter-follower configuration.

The ac load resistor for this stage is R110. C104 forms a bypass circuit around Q103 to drive the Q104 effectively.

Dc bias adj.
(Idling current)
Q103, R109

Q103 is forced to conduct and operates as a small resistance providing the necessary forward bias on the two cascaded emitter-followers.

R109 controls the base bias of Q103, determining the impedance between the emitter and collector of Q103, and thereby controls the dc bias voltage for the following driver circuit.

Thermal compensa-
tor for dc bias
D102

The negative temperature coefficient of D102 provides thermal compensation for the driver and power transistor circuit. D102 is attached to the power transistor's heat sink to detect heat increase in the power transistors.

Driver
Q104, Q105

These transistors operate as emitter-followers to provide the current swings demanded of the output stages and also provide the necessary phase inversion. Phase inversion is performed by using PNP and NPN type transistors.

Resistors R112 and R118 in the collector circuit limit the maximum current flow (which occurs when the output is shorted) to protect the transistors from destruction.

Stage/Control

Function

Power supply
rectifier
D301

A full-wave bridge rectifier provides a positive and a negative dc power supply for the power amplifier.

Ripple filter
Q301, Q302
R301, R303
C308, C310
C307, C309

These components reduce the ripple voltages in the dc power supply for the preamplifier and driver stages of the power amplifier section to an extremely-low value.

Q301 and Q302 serve as an electronic filter to supply well filtered of about ± 37.5 volts to each stage.

The ripple filters also serve as a muting circuit and are part of the overload protection circuit.

Muting circuit
R301, C308
(R303, C310)

"Popping" noise due to initial charging current flow to the electrolytic capacitor in the emitter circuit of Q101 is relatively small.

R301 and C308 (R303 and C310) comprise an RC network with a long time constant.

This eliminates popping because Q301 and Q302 are brought into conduction gradually when the POWER switch is turned on. On the other hand, when the POWER switch S1-1 is turned off, the input terminal is shorted to ground through a set of contacts on the POWER switch S1-2 making the shut-off operation noiseless.

Power transistor
Q106, Q107

The output transistors (Q106 and Q107) are connected directly to a power supply of about ± 40 v potential. Q106 supplies power to the load during the positive half cycle and Q107 operates during the negative half cycle. As a result, the large coupling capacitor at the output (which may cause power loss or distortion

Stage/ControlFunction

R115, R116

at low frequencies) is eliminated.

R115 and R116 (0.5 ohm) are inserted in the output circuit of the power transistors to avoid nonlinear distortion and improve stability.

Heat-sensitive
overload protection
circuit
Q303, Q304

To protect over loaded power transistors from destruction, a heat-sensitive protection circuit is employed.

It operates as follows: Under normal conditions, voltage dividers consisting of resistors and posistors (resistors having a positive temperature coefficient) are arranged to place nearly zero bias on Q304, thereby cutting it off. Though the collector of Q304 is directly coupled to the base of Q302 (ripple filter), it has no effect upon Q302's operation. The same is true of Q303, which is connected to the base of Q301 (ripple filter) except for its bias circuit. The base of Q303 is connected to the positive and negative ripple filter output through R306 (10 k) and R307 (10 k) respectively. This places nearly zero bias upon Q303, and cuts it off.

In the event of a short circuit at the output terminals or a thermal runaway, excessive current flows in the power transistors (for the amount of drive voltage supplied), causing the power transistors to overheat.

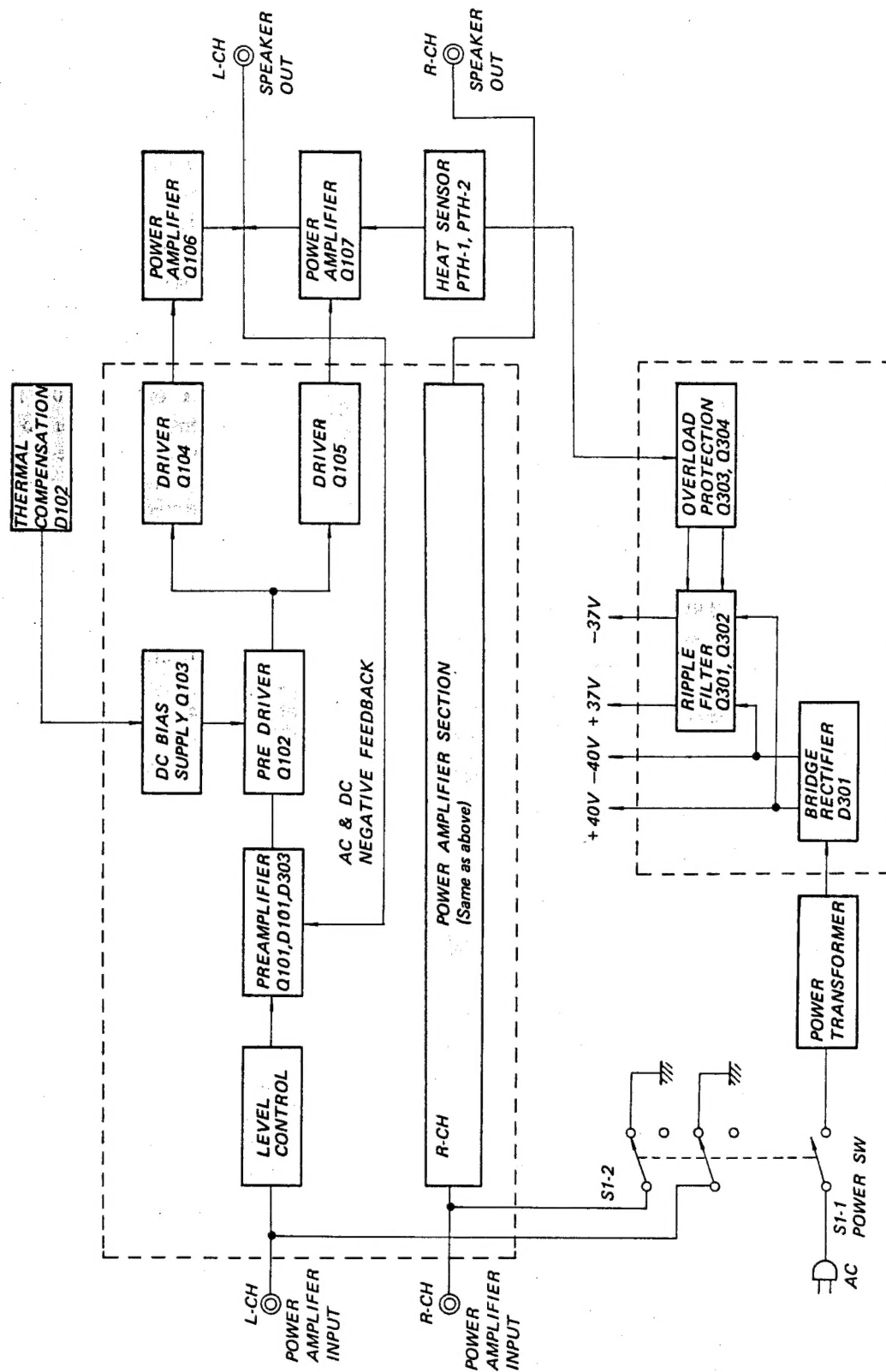
The heat caused by excessive dissipation at the collectors of the power transistors is sensed by the posistor attached to the transistors. These posistors have a positive temperature coefficient so the heat causes their resistance to increase at some specified temperature.

Stage/ControlFunction

This places forward bias voltage on Q304. The two posistor are arranged as an OR gate, so a malfunction in either channel will be detected. Q304's turnon turns off Q302, thereby reducing the negative supply voltage. This also makes the positive supply voltage decrease because the reduction of negative supply voltage increases the positive bias voltage upon Q303, forcing it into conduction.

As a result, Q301 turns off, cutting off power to the pre-amplifier and pre-driver stages. Now the driver stages cannot drive the power transistors despite an input signal. Since the output transistors are operated close to class B, the absence of drive reduces their collector current to practically zero.

1-3. BLOCK DIAGRAM



SECTION 2 DISASSEMBLY AND REPLACEMENT PROCEDURES

WARNING

Unplug the ac power cord before starting any disassembly or replacement procedures.

2-1. TOOLS REQUIRED

The following tools and materials are required to perform disassembly and replacement procedures on the TA-3060.

Screwdriver
Phillips head screwdriver
Soldering iron, 30 to 50 watts
Solder, rosin core
Long-nose pliers
Diagonal cutters
Silicone grease
Nutdriver

2-2. HARDWARE IDENTIFICATION GUIDE

The following chart will help you to decipher the hardware codes given in this service manual.

Note: All screws in the TA-3060 are manufactured to the specifications of International Organization for Standardization (ISO). This means that the new and old screws are not interchangeable. ISO screws have a different number of threads per mm compared to the old ones. The ISO screws have an identification mark on their heads as shown in Fig. 2-1.

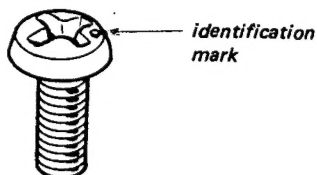
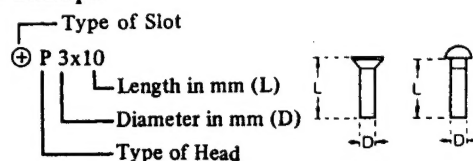


Fig. 2-1 ISO screw

Hardware Nomenclature

P	- Pan Head Screw		
PS	- Pan Head Screw with Spring Washer		
K	- Flat Countersunk Head Screw ...		
B	- Binding Head Screw		
RK	- Oval Countersunk Head Screw ..		
T	- Truss Head Screw		
R	- Round Head Screw		
F	- Flat Fillister Head Screw		
SC	- Set Screw		
E	- Retaining Ring (E Washer)		
	W - Washer		
	SW - Spring Washer		
	LW - Lock Washer		
	N - Nut		

- Example -



2-3. TOP COVER AND FRONT PANEL REMOVAL

1. Remove the four machine screws at each side of the set, and lift off the top cover.
2. Remove the two self-tapping screws (+R 3 X 6) at the front bottom side of the chassis. See Fig. 2-2.
3. Remove the POWER switch knob by pulling it out.
4. Remove the two screws (+PS 4 X 6) securing the front panel to the chassis from the back. See Fig. 2-3.

2-4. POWER SWITCH REPLACEMENT

1. Remove the front panel. See Procedure 2-3.
2. Remove the two screws (+P 3 X 6) securing the POWER switch to the chassis. Remove the switch.

3. Unsolder and remove the ac cord and encapsulated component from the defective switch.
4. Solder the cord and encapsulated component to the new switch.
5. Install the new switch.

2-5. PILOT LAMP REPLACEMENT

1. Remove the top cover. See Procedure 2-3.
2. Straighten the tab of the lamp socket bracket to permit removing the lamp.
3. Unscrew the lamp from the socket and install a new lamp.

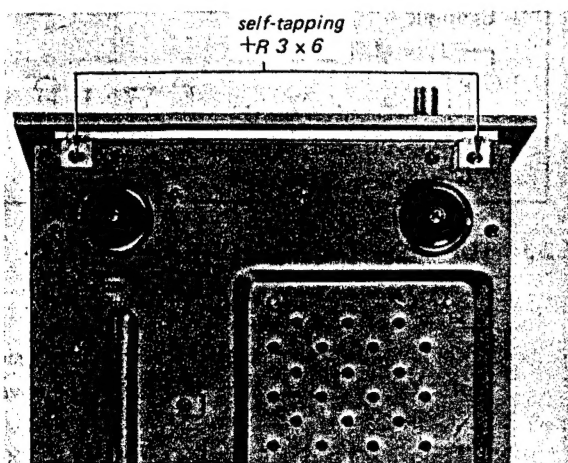


Fig. 2-2 Front panel removal (1)

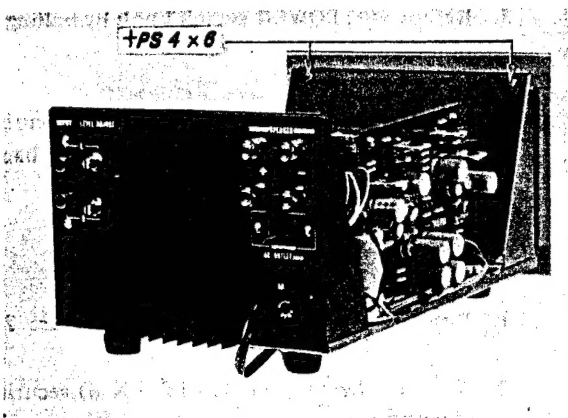


Fig. 2-3 Front panel removal (2)

4. Care should be taken not to lose the black lamp shade.

2-6. POWER TRANSISTOR REPLACEMENT

1. Remove the top cover. See Procedure 2-3.
2. Remove the four self-tapping screws (+R 3 X 6) securing the rear panel to the chassis from the bottom. See Fig. 2-4. Carefully tilt it backward and down.
3. Remove the four self-tapping screws (+R 3 X 6) that secure the heat sink to the chassis from the bottom. See Fig. 2-4.

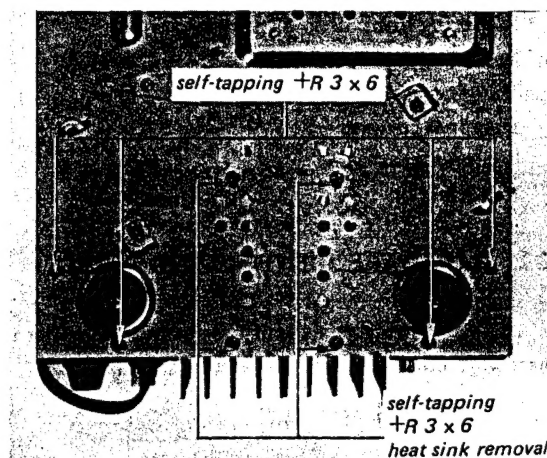


Fig. 2-4 Power transistor replacement (1)

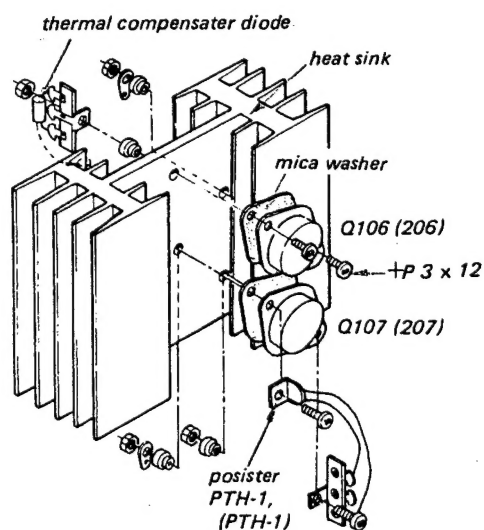


Fig. 2-5 Power transistor replacement (2)

3. Unsolder and remove the ac cord and encapsulated component from the defective switch.
4. Solder the cord and encapsulated component to the new switch.
5. Install the new switch.

2-5. PILOT LAMP REPLACEMENT

1. Remove the top cover. See Procedure 2-3.
2. Straighten the tab of the lamp socket bracket to permit removing the lamp.
3. Unscrew the lamp from the socket and install a new lamp.

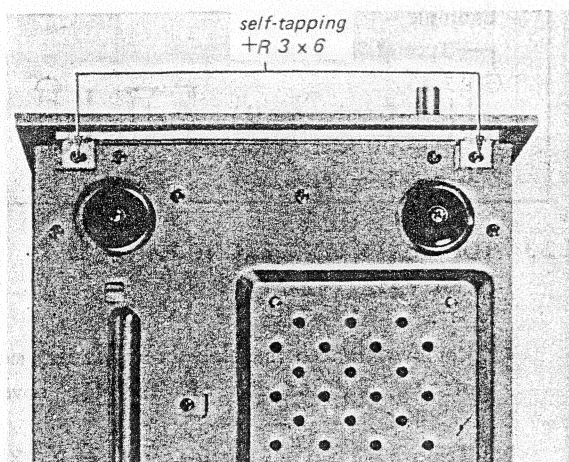


Fig. 2-2 Front panel removal (1)

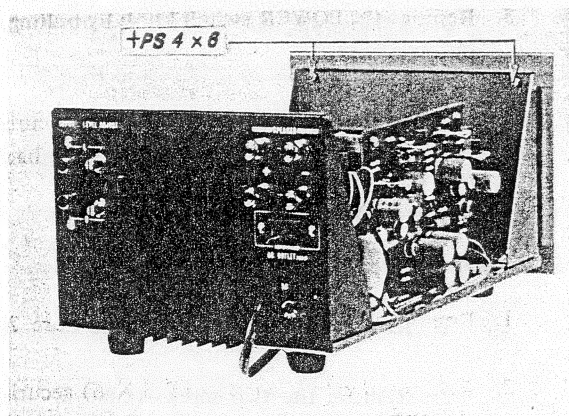


Fig. 2-3 Front panel removal (2)

4. Care should be taken not to lose the black lamp shade.

2-6. POWER TRANSISTOR REPLACEMENT

1. Remove the top cover. See Procedure 2-3.
2. Remove the four self-tapping screws (+R 3 X 6) securing the rear panel to the chassis from the bottom. See Fig. 2-4. Carefully tilt it backward and down.
3. Remove the four self-tapping screws (+R 3 X 6) that secure the heat sink to the chassis from the bottom. See Fig. 2-4.

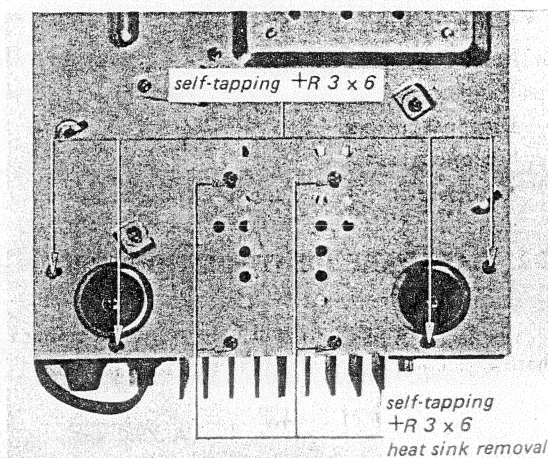


Fig. 2-4 Power transistor replacement (1)

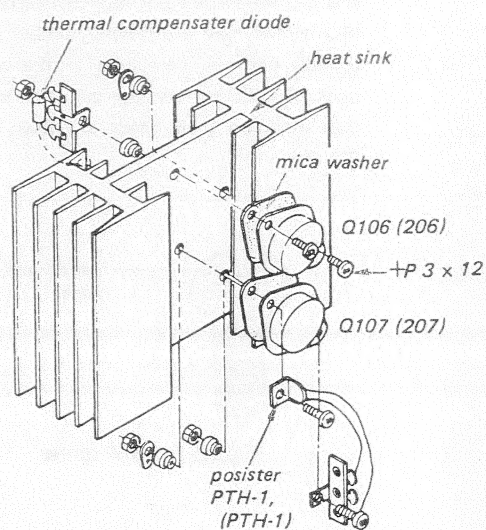


Fig. 2-5 Power transistor replacement (2)

4. Remove the defective power transistor by loosening the two screws (+P 3 X 12) securing it to the heat sink. See Fig. 2-5.
5. When replacing the power transistor, apply a coating of heat-transferring silicone grease to both sides of the insulating mica washer. The grease fills in any tiny gaps between the mating surfaces, thereby improving the heat transfer to the heat sink.
6. Any excess grease, squeezed out when the mounting bolts are tightened should be wiped off with a clean cloth to prevent the accumulation of conductive dust particles that might eventually cause a short.

2-7. REPLACEMENT OF COMPONENTS SECURED TO THE REAR PANEL BY RIVETS

1. Remove the rivets securing the defective component as follows:
 - (a) Remove the rear panel, then bore out the rivet using a drill bit slightly larger in diameter than the rivet. See Fig. 2-6.

- (b) When the peened end is bored away, push out the remainder of the rivet.

2. Remove the defective component and then install a new one.
3. Secure the new component with a suitable screw and nut.

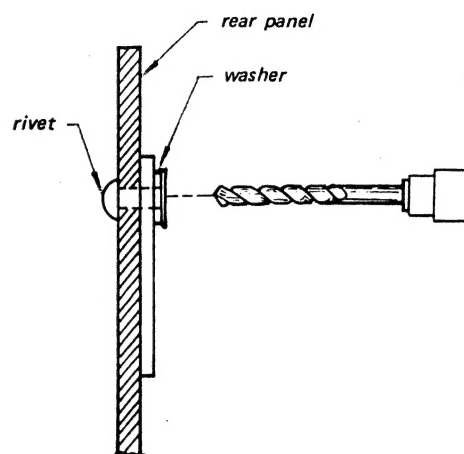


Fig. 2-6 Rivet replacement

2-8. CHASSIS LAYOUT

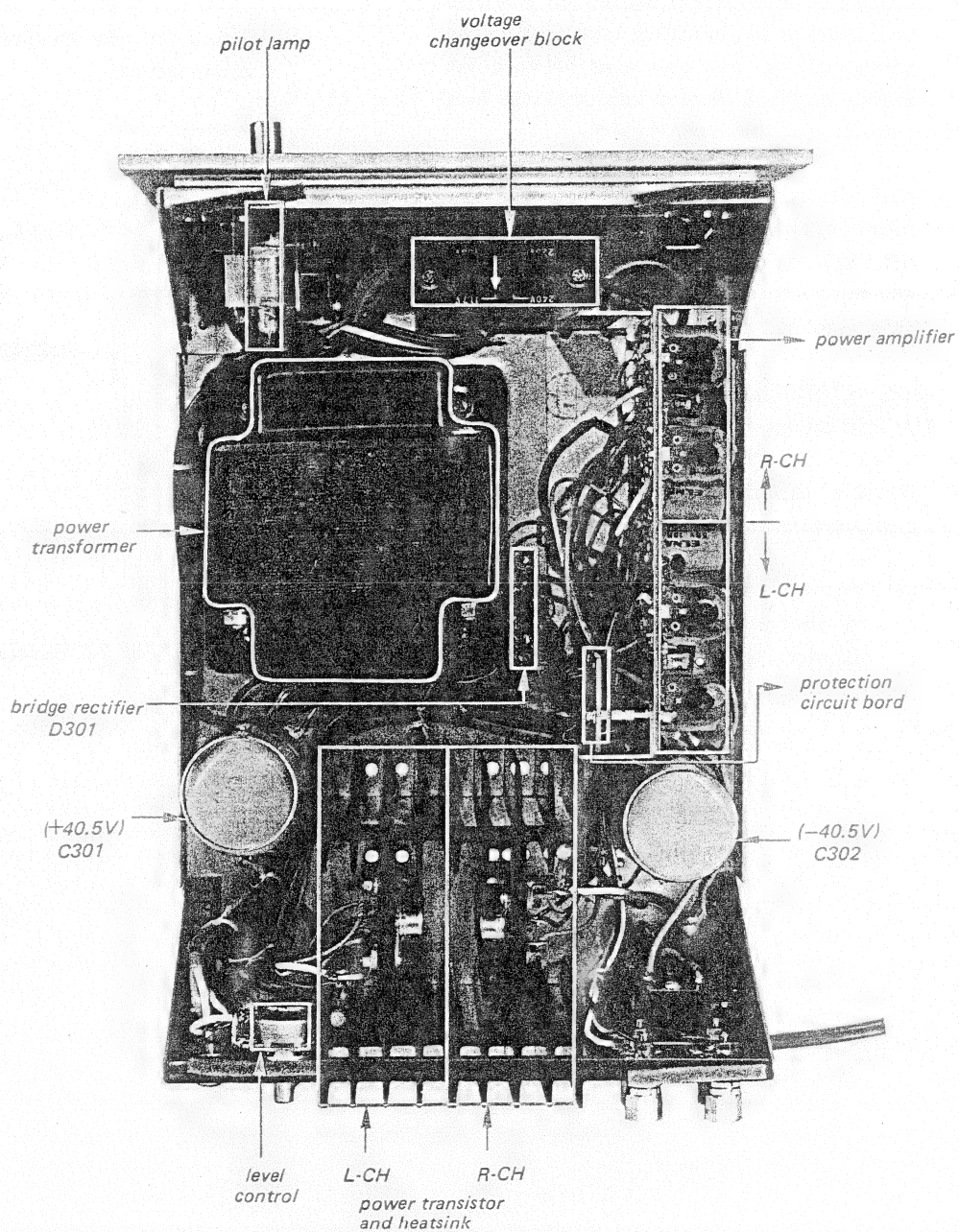


Fig. 2-7 Chassis layout

SECTION 3 ADJUSTMENTS

Note: There are two adjustment items in the power amplifier. One is dc-bias adjustment and the other is ac-balance adjustment. These adjustments should be alternately repeated two or three times after replacing any of the power transistors until the best operation is obtained.

3-1. DC BIAS ADJUSTMENT

Serious deficiencies in performance, such as thermal runaway of power transistors, will result if this adjustment is improperly set.

CAUTION

To avoid accidental power transistor damage, increase the ac line voltage gradually, using a variable transformer, while measuring the voltage across emitter resistors R115, and R116 (or R215 and R216) as shown in Fig. 3-1. Check to see that the reading does not exceed 50 mV. If it does, turn off the power immediately, then check and repair the trouble in the power-amplifier board.

Test Equipment Required

1. Dc millivoltmeter
2. Variable transformer
3. Screwdriver with 3mm (1/8") blade

Preparation

1. Remove the top cover as described in Procedure 2-3.
2. Connect the dc millivoltmeter between R115 and R116 (R215 and R216) as shown in Fig. 3-1.

Procedure

1. Apply a drop of cement solvent to the semifixed resistors (Fig. 3-1) on the power-amplifier board, and then wait a few seconds for the cement to dissolve.

2. Set the semifixed resistors as follows:

R109 (L-CH, dc bias) fully counter-clockwise

R209 (R-CH, dc bias) fully clockwise

R106, R206 (ac balance) midposition

3. Set the variable transformer for minimum output.

4. Turn the POWER switch, then increase the line voltage up to the rated value.

5. Adjust R109 (R209) to obtain a 50 mV reading on the meter.

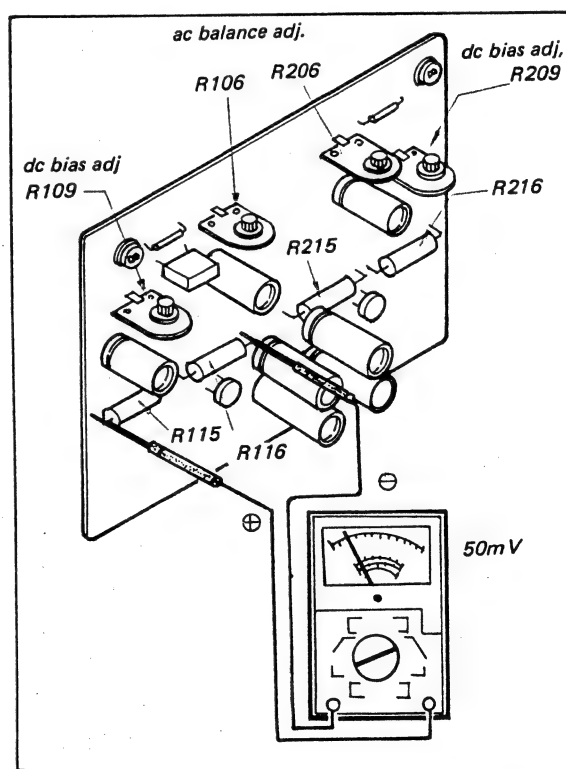


Fig. 3-1 Connection of dc voltmeter across R115 and R116

3-2. AC BALANCE ADJUSTMENT

Excessive harmonic distortion at high levels will result if this adjustment is improperly set.

Test Equipment Required

1. Dc null meter or dc millivoltmeter
2. Screwdriver with 3mm (1/8") blade

Preparation

1. Remove the top cover as described in Procedure 2-3.
2. Connect the dc null-meter or dc milli voltmeter to the speaker output terminal.

Procedure

1. Apply a drop of cement solvent to R106 (R206) and wait a few seconds for the lock paint to dissolve.
2. Turn the POWER switch to ON and then adjust the R106 (R206) to obtain a 0 volt reading on the meter.
3. After 10 minutes warm-up alternately repeat this and the dc bias adjustment two or three times.
4. After completing the adjustment, apply a drop of lock paint to R109 and R106 (R209 and R206).

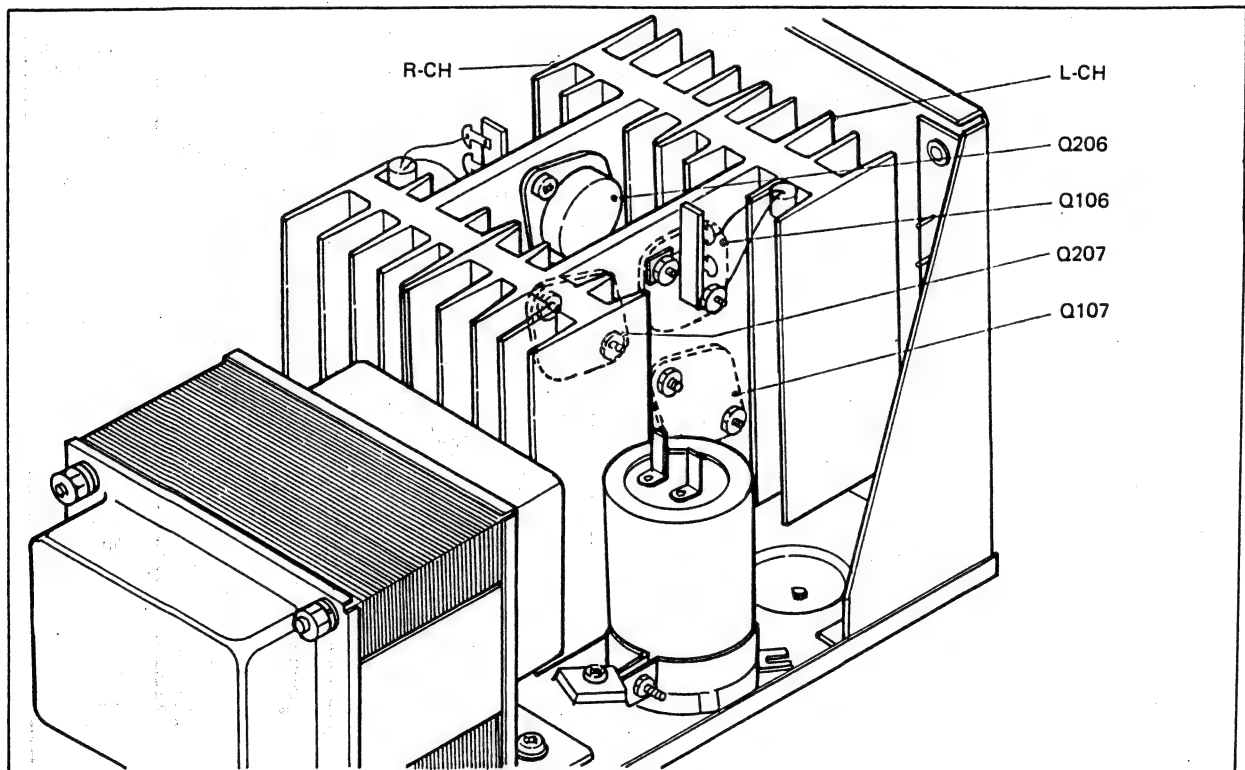


Fig. 3-2 Location of power transistors

SECTION 4 REPACKING

The TA-3060's original shipping carton and packing material is the ideal container for shipping the unit.

However, to secure the maximum protection, the TA-3060 must be repacked in this material precisely as before. The proper repacking procedure is shown in Fig. 4-1.

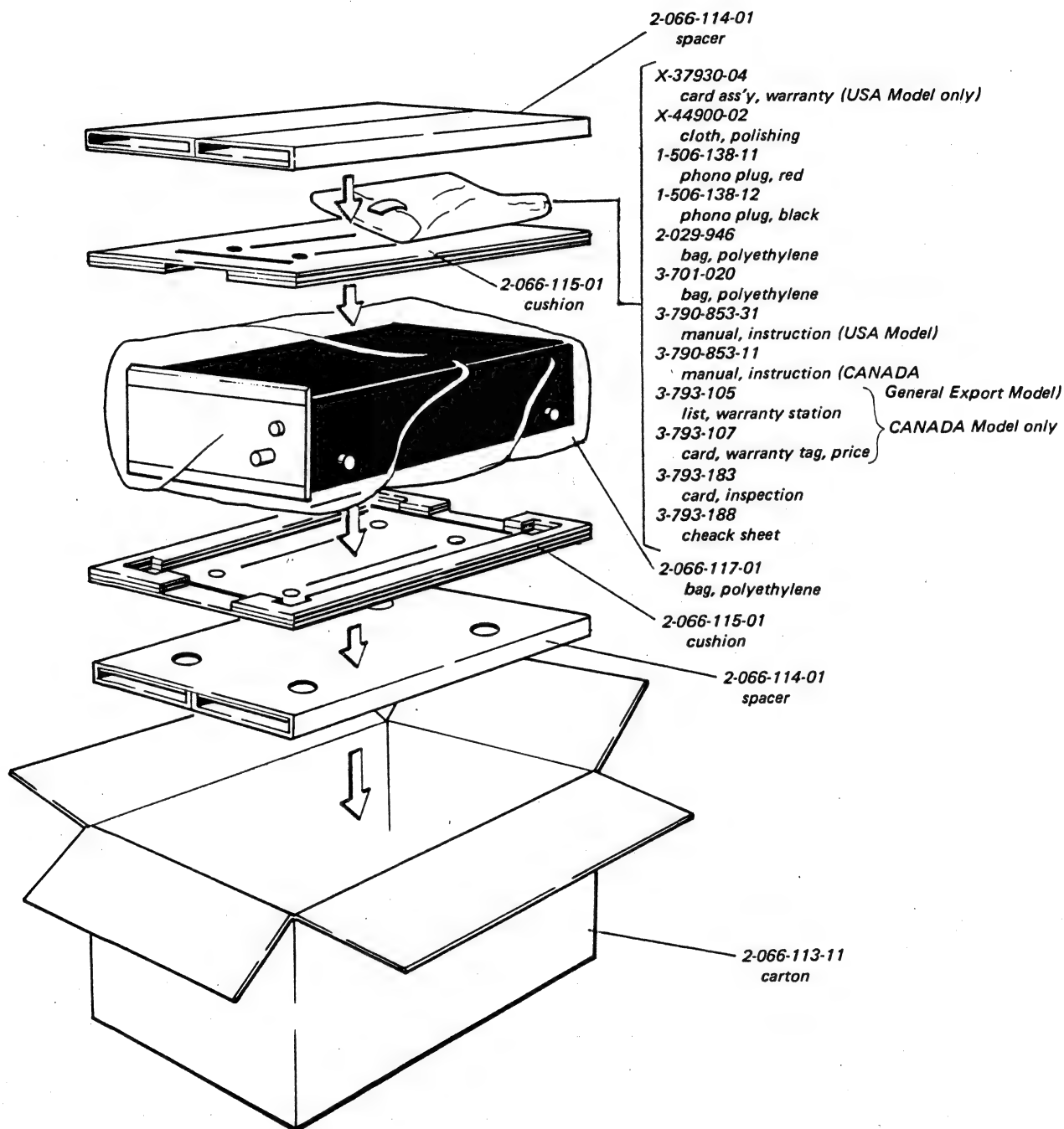
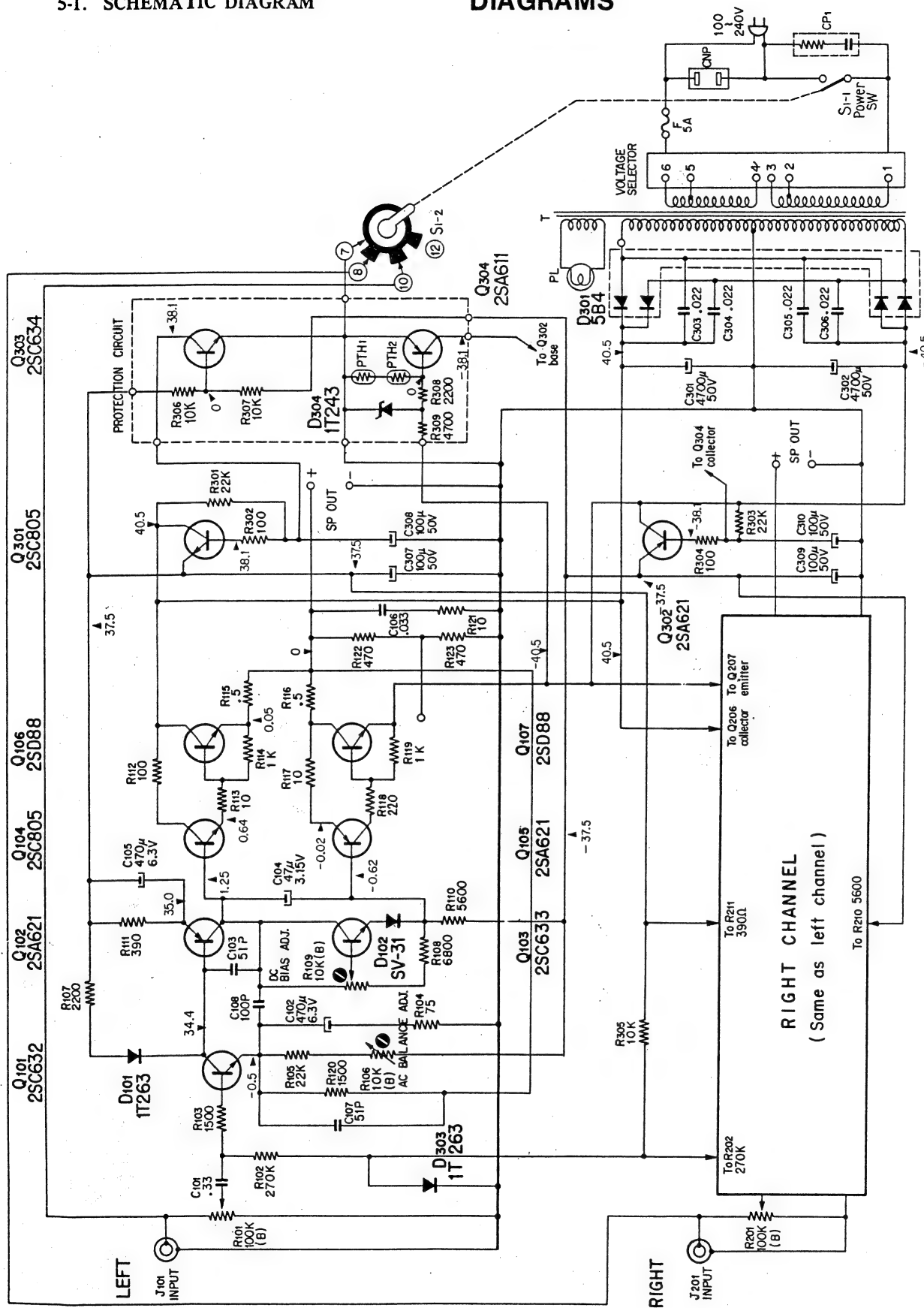


Fig. 4-1 Repacking

SECTION 5 DIAGRAMS

5-1. SCHEMATIC DIAGRAM



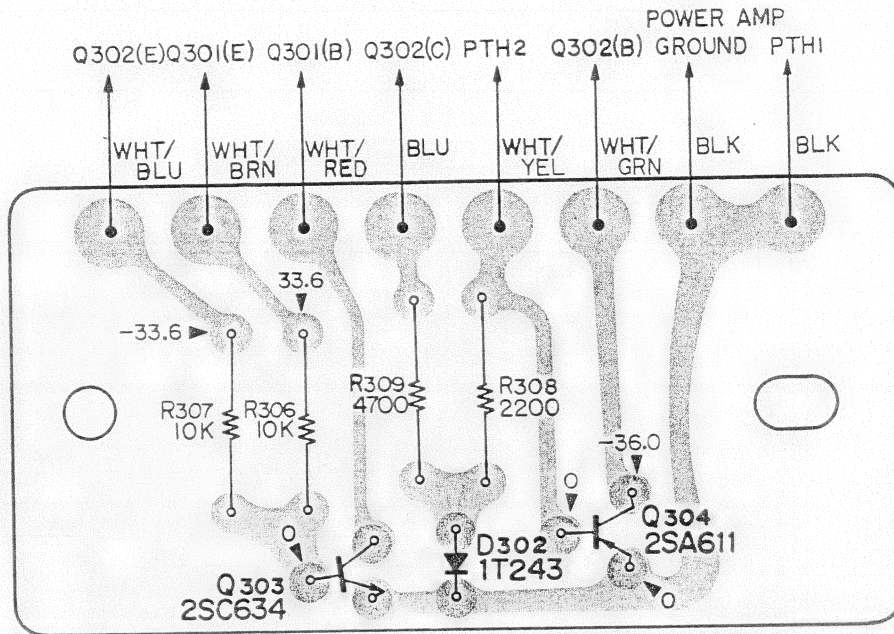
Note:

- All resistance values are in ohms. $k=1000$, $M=1000$ k
- All capacitance values are in μF except as indicated with p, which means μF .
- All voltages represent an average value and should hold within $\pm 20\%$.
- All voltages are dc measured with a VOM which has an input impedance of 20 k ohms/volt. No signal in.

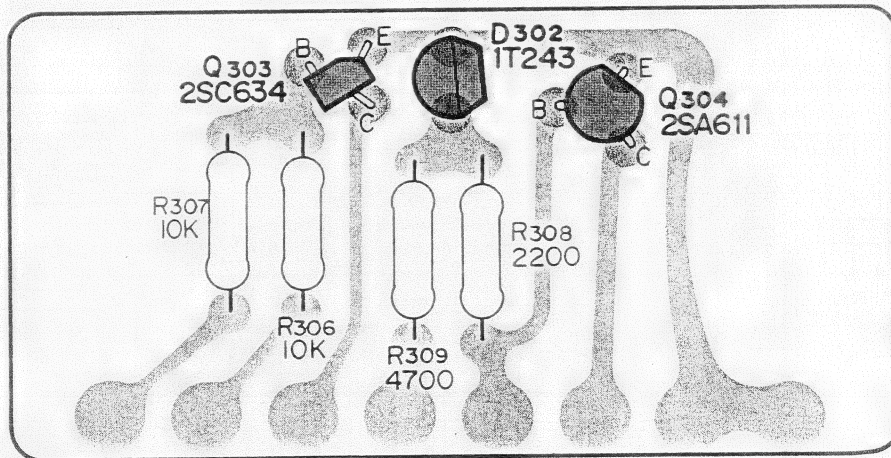
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TA-3060
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5-2. MOUNTING DIAGRAM—Protection Circuit Board

—Conductor Side—

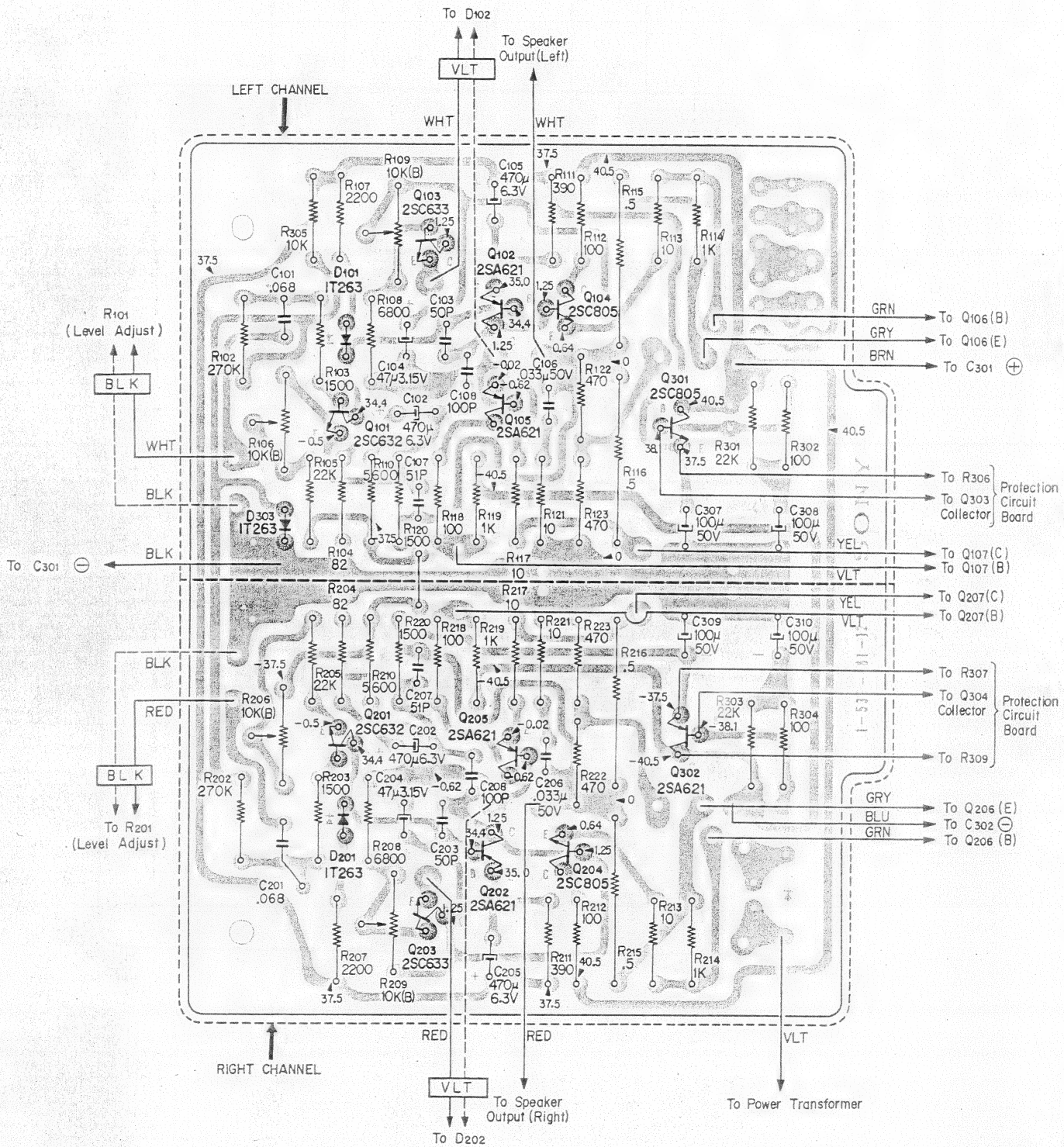


—Component Side—



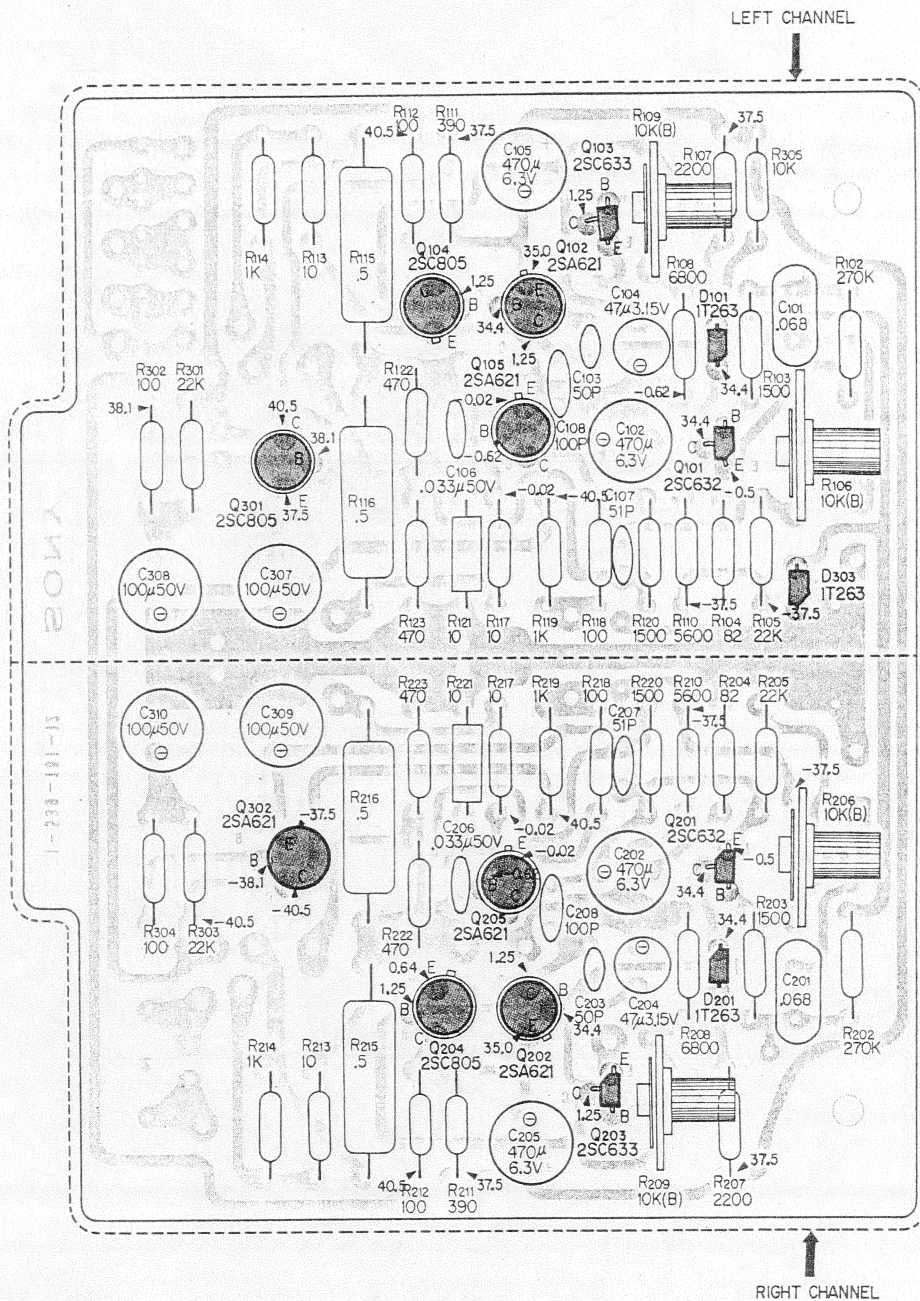
5-3. MOUNTING DIAGRAM—Power Amplifier Board

—Conductor Side—

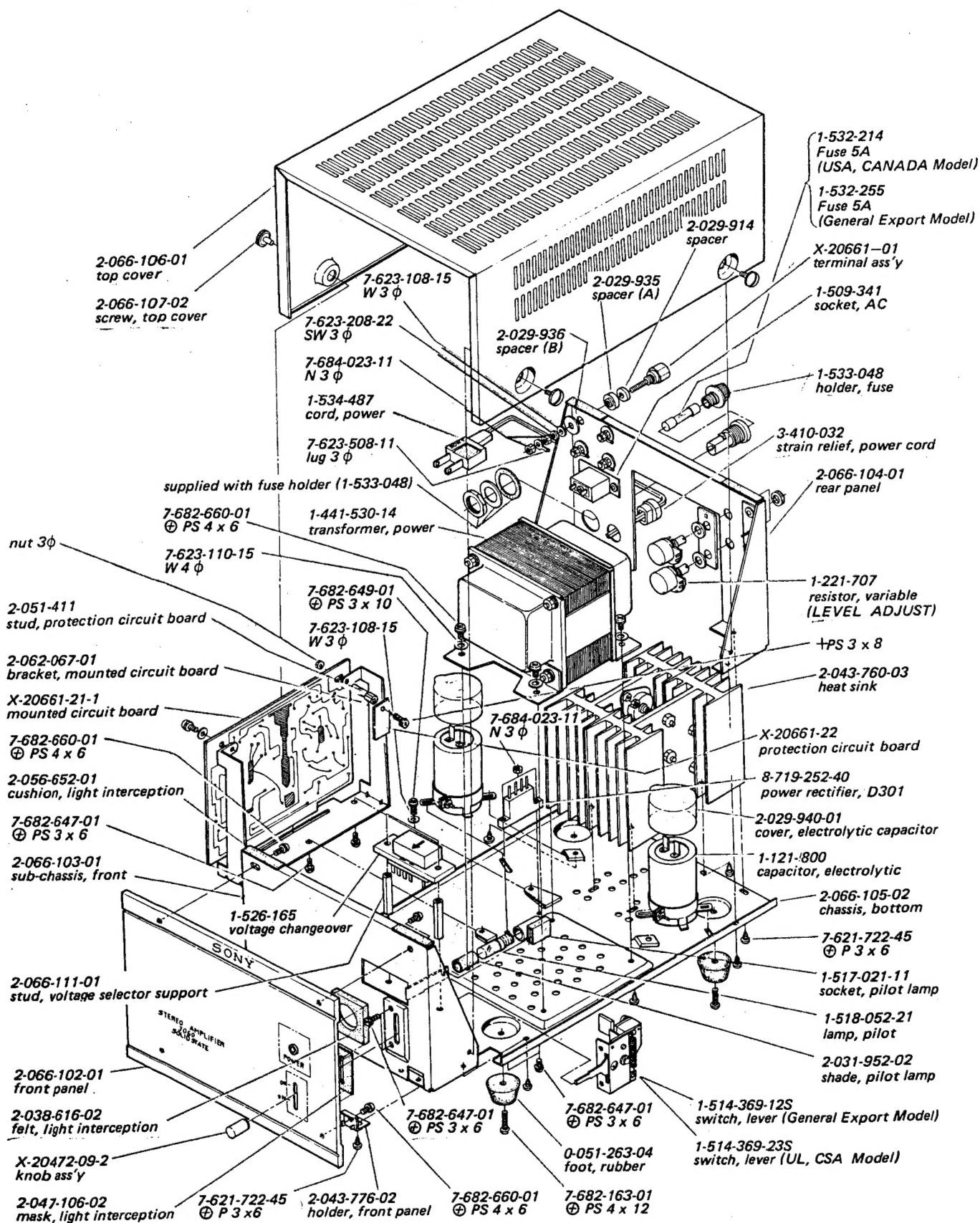


5-3. MOUNTING DIAGRAM—Power Amplifier Board

—Component Side—



SECTION 6 EXPLODED VIEW



PS = pan head screw with spring washer

SECTION 7 ELECTRICAL PARTS LIST

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
Mounted Circuit Boards			C304	1-105-877-12	0.022 $\pm 20\%$ 100V mylar
			C305	1-105-877-12	0.022 $\pm 20\%$ 100V mylar
			C306	1-105-877-12	0.022 $\pm 20\%$ 100V mylar
	X-20661-21	power amplifier circuit board	C307(C310)	1-121-384	100 $\pm 100\%$ 50V electrolytic
	X-20661-22	protection circuit board	C308(C309)	1-121-384	100 $\pm 100\%$ 50V electrolytic
Semiconductors			Resistors		
D101(D201)		diode, 1T263	All resistance values are in ohms, $\pm 5\%$, 1/4 watts and carbon type unless otherwise indicated.		
D102(D202)		diode, SV-31			
D301		diode, 5B4	R101(R201)	1-221-707	100K (B) variable
D303		diode, 1T263	R102(R202)	1-244-731	270K
D304		diode, 1T243M	R103(R203)	1-244-677	1.5K
PTH 1	1-800-064	posistor	R104(R204)	1-244-646	75
PTH 2	1-800-064	posistor	R105(R205)	1-244-705	22K
Q101(Q201)		transistor, 2SC632	R106(R206)	1-221-967	10K (B) semi-fixed
Q102(Q202)		transistor, 2SA621	R107(R207)	1-244-681	2.2K
Q103(Q203)		transistor, 2SC633	R108(R208)	1-244-693	6.8K
Q104(Q204)		transistor, 2SC805	R109(R209)	1-221-967	10K (B) semi-fixed
Q105(Q205)		transistor, 2SA621	R110(R210)	1-244-691	5.6K
Q106(Q206)		transistor, 2SD88	R111(R211)	1-244-663	390
Q107(Q207)		transistor, 2SD88	R112(R212)	1-244-649	100
Q301		transistor, 2SC805	R113(R213)	1-244-625	10
Q302		transistor, 2SA621	R114(R214)	1-244-673	1K
Q303		transistor, 2SC634	R115(R215)	1-207-151	0.5 $\pm 10\%$ 1.5W wire-wound
Q304		transistor, 2SA611	R116(R216)	1-207-151	0.5 $\pm 10\%$ 1.5W wire-wound
Transformer			R117(R217)	1-244-625	10
			R118(R218)	1-202-557	220 $\pm 10\%$ 1/2W composition
	1-441-530-14	transformer, power	R119(R219)	1-244-673	1K
Capacitors			R120(R220)	1-244-677	1.5K
			R121(R221)	1-202-525	10 $\pm 10\%$ 1/2W composition
			R122(R222)	1-244-665	470
			R123(R223)	1-244-665	470
All capacitance values are in μF except as indicated with P, which means $\mu\text{M}\text{F}$.			R301(R303)	1-244-705	22K
C101(C201)	1-105-691-12	0.33 $\pm 10\%$ 50V mylar	R302(R304)	1-244-649	100
C102(C202)	1-121-359	470 $\pm 100\%$ 6.3V electrolytic	R305	1-244-697	10K
C103(C203)	1-107-124	51p $\pm 10\%$ 50V silvered mica	R306	1-244-697	10K
C104(C204)	1-121-287	47 $\pm 100\%$ 3.15V electrolytic	R307	1-244-697	10K
C105(C205)	1-121-359	470 $\pm 100\%$ 6.3V electrolytic	R308	1-244-681	2.2K
C106(C206)	1-105-679-12	0.033 $\pm 10\%$ 50V mylar	R309	1-244-689	4.7K
C107(C207)	1-107-124	51p $\pm 10\%$ 50V silvered mica	Switch		
C108(C208)	1-107-131	100p $\pm 10\%$ 50V silvered mica			
C301	1-121-800	4700 $\pm 100\%$ 50V electrolytic	S1	1-514-369-12S	switch, lever (POWER)
C302	1-121-800	4700 $\pm 100\%$ 50V electrolytic		1-514-369-23S	General Export Model
C303	1-105-877-12	0.022 $\pm 20\%$ 100V mylar			switch, lever (POWER)
					USA, CANADA Model

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
Miscellaneous					
	1-231-057-12	encapsulated component, 120 Ω + 0.033 μ F		1-526-165	voltage changeover block
	1-507-142-13	phono jack, 2-p		1-532-214	fuse 5A (USA, CANADA Model)
	1-509-015	ac outlet (General Export Model)		1-532-255	fuse 5A (General Export Model)
	1-509-341-12	ac outlet (USA, CANADA Model)		1-533-048	holder, fuse
	1-517-021	socket, pilot lamp		1-534-487-22	cord, power (General Export Model)
	1-518-052-21	lamp, pilot		1-534-526-21	cord, power (USA, CANADA Model)
				1-536-179	terminal strip, 1L1 (C)

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